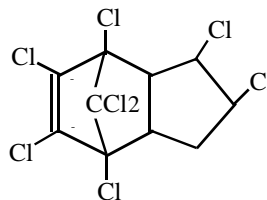


CHLORDANE

Chlordane is a federal hazardous air pollutant and was identified as a toxic air contaminant in April 1993 under AB 2728.

CAS Registry Number: 57-74-9

Molecular Formula: $C_{10}H_6Cl_8$



Chlordane is a viscous, amber colored liquid with a penetrating or aromatic odor. It is insoluble in water and miscible with aliphatic and aromatic hydrocarbon solvents, including deodorized kerosene. Chlordane also decomposes in weak alkalis (Merck, 1989; HSDB, 1991).

Physical Properties of Chlordane

Synonyms: 1,2,4,5,6,7,8,8-octachloro-2,3,3a,4,7,7a-hexahydro-4,7-methano-1H-indene;
1,2,4,5,6,7,8,8-octachloro-4,7-methane-3a,4,7,7a-tetrahydroindane; CD-68;
Velsico 1068; Toxichlor; Niran; Octachlor; Orthochlor; Synklor; Corodane; Belt

Molecular Weight:	409.8
Boiling Point:	175 °C at 2 mm Hg
Melting Point:	107 - 108.8 °C (cis-isomer) 103 - 105 °C (trans-isomer) 131 °C (gamma-isomer)
Vapor Density:	14 (air = 1 at boiling point of chlordane)
Density/Specific Gravity:	1.59 - 1.63 at 25/4 °C (water=1)
Vapor Pressure:	1×10^{-5} mm Hg at 25 °C
Log Octanol/Water Partition Coefficient:	2.78
Water Solubility	5.54 (estimated for pure chlordane) 0.1 mg at 25 °C (technical chlordane)
Conversion Factor:	1 ppm = 16.8 mg/m ³

(Howard, 1990; HSDB, 1991; Merck, 1989; Sax, 1989; U.S. EPA, 1994a)

SOURCES AND EMISSIONS

A. Sources

Chlordane was formerly used as an insecticide. All commercial use of chlordane in the United States was canceled by the United States Environmental Protection Agency (U.S. EPA) (Howard, 1990). As of March 30, 1989, chlordane is no longer registered for pesticidal use in California

(DPR, 1996).

B. Emissions

No emissions of chlordane from stationary sources in California were reported, based on data obtained from the Air Toxics "Hot Spots" Program (AB 2588) (ARB, 1997b).

C. Natural Occurrence

No information about the natural occurrence of chlordane was found in the readily-available literature.

AMBIENT CONCENTRATIONS

No Air Resources Board data exist for ambient measurements of chlordane. Chlordane has been detected at several locations throughout the United States. Mean concentrations of chlordane ranged from 1.05 nanograms per cubic meter (ng/m^3) or 0.06 parts per billion (ppb) from 1979-80 in College Station, Texas, to 38.4 ng/m^3 or 2.29 ppb during 1987-88 in Jacksonville, Florida (U.S. EPA, 1993a).

INDOOR SOURCES AND CONCENTRATIONS

In the Nonoccupational Pesticide Exposure Study (NOPES), levels of 32 pesticides were measured in 24-hour samples obtained inside and outside homes located in two cities. Approximately 70 homes in Jacksonville, Florida were monitored in each three seasons, and approximately 50 homes in Springfield/Chicopee, Massachusetts were monitored in each of two seasons. The mean indoor concentrations of chlordane ranged from 220 to 324 ng/m^3 in Jacksonville and from 34.8 to 199 ng/m^3 in Springfield/Chicopee. For both cities, average indoor chlordane concentrations were higher than corresponding outdoor concentrations (Immerman and Schaum, 1990a).

ATMOSPHERIC PERSISTENCE

Chlordane, in the atmosphere, is mainly in the vapor phase. It will react with photochemically-produced hydroxyl radicals and has a calculated half-life of 2 to 7 days (Atkinson, 1995). Direct photolysis of chlordane should not occur. The cis-isomer of chlordane is more susceptible to photolysis than the trans-isomer (HSDB, 1991). Chlordane has also been detected in remote locations which indicates that long range transport occurs. Particulate phase chlordane may be physically removed from the atmosphere by wet and dry deposition (Howard, 1990). Chlordane may also remain in the soil for over 20 years (U.S. EPA, 1994a).

AB 2588 RISK ASSESSMENT INFORMATION

Chlordane emissions are not reported from stationary sources in California under the AB 2588 program. It is also not listed in the California Air Pollution Control Officers Association Air Toxics "Hot Spots" Program Revised 1992 Risk Assessment Guidelines as having health values (cancer or non-cancer) for use in risk assessments (CAPCOA, 1993).

HEALTH EFFECTS

Probable routes of human exposure to chlordane are inhalation, ingestion, and dermal contact.

Non-Cancer: Chlordane is a hepatotoxicant and central nervous system convulsant. Acute inhalation exposure can cause effects on the nervous, respiratory and cardiovascular systems. The U.S. EPA is currently reviewing the Reference Concentration (RfC) for chlordane (U.S. EPA, 1994a).

The U.S. EPA Reference Dose (RfD) for chlordane is 6×10^{-5} milligrams per kilogram per day based on liver hypertrophy in rats. The U.S. EPA estimates that consumption of this dose or less, over a lifetime, would not likely result in the occurrence of chronic, non-cancer effects (U.S. EPA, 1994a).

Reduced fertility was observed in an early report of male and female rats treated with chlordane. There are two reports in rodents of increased postnatal death following lactation by dams treated orally with chlordane. There are also reports of neurological and immunological effects in pups of mouse dams treated with chlordane. Some of these effects may be mediated by lactational exposure to chlordane secreted in milk (ATSDR, 1994; HSDB, 1995).

Cancer: Data from human studies are inconclusive regarding the carcinogenicity of chlordane. Liver cancer has been reported in mice and male rats exposed to chlordane via ingestion (U.S. EPA, 1994a).

The U.S. EPA has classified chlordane as Group B2: Probable human carcinogen. The U.S. EPA has established an inhalation potency value for use in risk assessments of 3.7×10^{-4} (microgram per cubic meter)⁻¹. The U.S. EPA estimates that, if an individual were to breathe air containing chlordane at 0.003 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$) over his or her entire lifetime, that person would theoretically have no more than a 1 in 1 million increased chance of developing cancer (U.S. EPA, 1994a). The International Agency for Research on Cancer (IARC) has classified chlordane as Group 2B: Possible human carcinogen based on sufficient evidence in animals (IARC, 1991b).

The State of California has determined under Proposition 65 that chlordane is a carcinogen (CCR, 1996). The inhalation potency factor that has been used as a basis for regulatory action in California is 3.4×10^{-4} (microgram per cubic meter)⁻¹ (OEHHA, 1994). In other words, the potential excess cancer risk for a person exposed over a lifetime to $1 \mu\text{g}/\text{m}^3$ of chlordane is estimated to be no greater than 340 in 1 million. The oral potency factor that has been used as a basis for regulatory action in California is 1.2 (milligram per kilogram per day)⁻¹

(OEHHA, 1994).